IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
REQUEST FOR FILING NATIONAL PATENT APPLICATION
Under 35 USC 111(a) and Rule 53(b)

PATENT APPLICATION

jc841 U.S. PTO
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11/13/00

Hon. Commissioner of Patents
Washington, D.C. 20231

JC891 U.S. PTO
11/13/00

WITH SIGNED DECLARATION

NONPROVISIONAL NON REISSUE NON PCT NAT PHASE

Sir:

Herewith is the PATENT APPLICATION of
Inventor(s): Slobodan JOVANOVIC et al.

Title METHOD OF DATA RATE EXCHANGE FOR TRANSMISSIONS ACROSS A PACKET-BASED NETWORK

Atty. Dkt.: PM 270173 (M#) | 12743MDUS02U (Client Ref)

including:

Date: November 13, 2000

1. Specification: 24 pages (only spec. and claims)   2. ☐ Specification in non-English language
3. Declaration ☒ Original ☐ Facsimile/Copy ☒ Abstract 1 page(s); 35 numbered claims
4. ☒ Drawings: 3 sheet(s) ☐ informal; ☒ formal of size: ☒ A4 ☐ 11"
5. ☐ See top first page re prior Provisional, National or International application(s). ("X" box only if info is there and do not complete corresponding item 5 or 6). (Prior M# ______ SN ______)
6. **AMEND the specification** please by inserting before the first line: -- This is a ☐ Continuation-in-Part ☐ Divisional ☐ Continuation ☐ Substitute Application (MPEP 201.09) of:
6(a) ☐ National Appln. No. / filed . (M#)
6(b) ☐ International Appln. No. ______ filed ______
.--
7. ☒ **AMEND the specification** by inserting before the first line: -- This application claims the benefit of U.S. Provisional Application No. 60/ 211,821, filed June 15, 2000 . --
8. ☒ Attached is an assignment and cover sheet. Please return the recorded assignment to the undersigned.
9. ☐ Prior application is assigned to ______

by Assignment recorded ______ Reel ______ Frame ______

10. **FOREIGN** priority is claimed under 35 USC 119(a)-(d)/365(b) based on filing in ______ (country)

11.

Application No.	Filing Date	Application No.	Filing Date
(1)		(2)	
(3)		(4)	
(5)		(6)	
(7)		(8)	
(9)		☐ See 3rd page for additional priorties	

12. ______ (No.) Certified copy (copies): ☐ attached; ☐ previously filed (date) ______
in U.S. Application No. / filed on ______
13. Small entity status ∅ ☒ is **not** claimed; ☐ is claimed (**Pre-filing confirmation required**)
13(a). ☐ Attached: ______ (No.) Small Entity Statement(s) (since 9/8/00 small entity statement(s) not essential to make claim)
13(b) ☐ See **NONPUBLICATION REQUEST** under Rule 213(a) attached (PAT-258)

14. **DOMESTIC/INTERNATIONAL** priority is claimed under 35 USC 119(e)/120/365(c) based on the following provisional, nonprovisional and/or PCT international application(s):

Application No.	Filing Date	Application No.	Filing Date
(1)		(4)	
(2)		(5)	
(3)		(6)	

jc841 U.S. PTO 09/709575 11/13/00

15. ☐ This application is being filed under Rule 53(b)(2) since an inventor is named in the enclosed Declaration who was not named in the prior application.

16. ☐ Attached:

17. ☐ Preliminary Amendment:

THE FOLLOWING FILING FEE IS BASED ON CLAIMS AS FILED LESS ANY ABOVE CANCELLED

				Large/Small Entity		Fee Code
18. Basic Filing Fee				$710/$355	$710	101/201
19. Total Effective Claims	35	minus 20 =	*15	x $18/$9 =	+ 270	103/203
20. Independent Claims	2	minus 3 =	*0	x $80/$40 =	+ 0	102/202
				*If answer is zero or less, enter "0"		
21. If any proper multiple dependent claim (ignore improper) is present, add (Leave this line blank if this is a reissue application)				+ $270/$135	+ 0	104/204
22.				**TOTAL FILING FEE ENCLOSED =**	$980	
23. If "non-English" box 2 is X'd, add Rule 17(k) processing fee				+ $130	+ 0	139
24. If "assignment" box 8 is X'd, add recording fee				+ $40	+ 40	581
25. ☐ Attached is a Petition/Fee under Rule No.				+ $130	+ 0	122
26.				**TOTAL FEE ENCLOSED =**	$1020	

Our Deposit Account No. 03-3975

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NOTE: **File in duplicate with 2 post card receipts (PAT-103) & attachments**

UNITED STATES PATENT APPLICATION

OF

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&

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FOR

METHOD OF DATA RATE EXCHANGE FOR TRANSMISSIONS ACROSS A PACKET-BASED NETWORK

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METHOD OF DATA RATE EXCHANGE FOR TRANSMISSIONS ACROSS A PACKET-BASED NETWORK

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention generally relates to the field of data communication systems. More particularly, the invention presents an improved method for exchanging data rate information across a packet-based network.

2. Priority Information

The present application claims domestic priority, under 35 U.S.C. § 119(e), based on U.S. Provisional Application No. 60/211,821, filed by the same inventive entity, Jovanovic *et al.*, on June 15, 2000, entitled "Procedure for Data Rate Exchange of Data/Fax Transmission Across a Packet-Based Network."

3. Description of Related Art and General Background

With the unprecedented growth of the Internet, as well as the advances in computer technologies, the Public Switched Telephone Network (PSTN) has evolved into a main communication infrastructure for data traffic. Customer premise equipment (CPE) having communication capabilities, such as, for example, facsimile machines and modems, are now prevalent in both homes and offices. More often than not, CPEs rely on the PSTN infrastructure to provide connectivity to remote locations and support data traffic transport.

FIG. 1A depicts the conventional transport of data traffic across PSTN **108**. As indicated in FIG. 1A, local CPE **102A** and remote CPE **102B** are respectively coupled by local access (i.e., local loop) to a telephone service provider's central switching office (CO) **104A, 104B**. CPEs **102A, 102B** are equipped with dial-up communication capabilities to initiate and establish connectivity. These capabilities operate in accordance with well-known communication protocols, such as, for example, ITU-T V series fax/data modem protocols, and in particular the V.34, *Series V: Data Communication Over the Telephone Network*, published in February 1998, the contents of which are herein expressly incorporated by reference. The V.34 protocol provides for the modulation, on-hook/off-hook, hand-shaking, and control signaling operations over PSTN **108**.

Typically, a local CPE **102A** initiates connectivity by dialing to remote CPE **102B**, which accesses a switching mechanism in the local CO **104A**. The local switching mechanism establishes an inter-office trunk connection to a remote switch in the remote CO **104B** corresponding to the dialed remote CPE **102B**. Upon achieving connectivity between the local CPE **102A** and remote CPE **102B**, a continuous, dedicated, circuit-switched, fixed channelized bandwidth is established for the duration of the call.

If the local and remote CPEs **102A, 102B** are facsimile machines, the digital data scanned from the imaging portion is then modulated in an analog form suitable for transmission across the local loop wires and ultimately conveyed to the dialed facsimile machine. The transmission between the local CPE **102A** and the remote CPE **102B** operates in half-duplex mode. Similarly, if the local and remote CPEs **102A, 102B** are modems, the digital data received from a connected computer is then modulated in an analog form suitable

for transmission across the local loop wires and ultimately conveyed to the dialed modem. In such a case, the transmission between the local CPE **102A** and the remote CPE **102B** operates in full-duplex mode.

There are, however, drawbacks in the use of PSTN **108** to accommodate data traffic. For example, performance problems arise because data calls do not use the voice bandwidth efficiently. Data traffic tends to be bursty in nature and most of the time a data connection is not actually transmitting data, it is simply reserving the connection in case it might use it. In addition, PSTN **108** was designed with the assumption that a relatively short call set-up time would be followed by a large amount of voice data being transferred. However, for data transfers, the call set-up time in the PSTN **108** is very long relative to the length of the individual data transfers. This is exacerbated by the fact that, in order to minimize latency caused by call set-up times, most users leave their telephone connections off-hook for the entire time of the session, which may last several hours.

In an effort to alleviate some of these performance issues, telephone service providers have developed Packet-Based Networks (PBN) on top of the PSTN **108** infrastructure to handle data traffic. FIG. 1B illustrates the conventional transport of data traffic across PBN **110**.

As depicted in FIG. 1B, local CPE **102A** and remote CPE **102B** are respectively coupled by local access to local and remote COs **104A, 104B**. In turn, local and remote COs **104A, 104B** are coupled to local and remote gateway mechanisms (GWs) **106A, 106B**, via PSTN **108A, 108B**, respectively. Local and remote GWs **106A, 106B** are configured to

demodulate the analog data traffic received from the local and remote COs **104A, 104B** into digital data and redirect the digital data to PBN **110**.

Prior to conveying the digital data over the PBN **110**, communication protocols, such as, for example, the aforementioned V.34 protocol, establish a local communications session between the local CPE **102A** and local GW **106A** and a remote communications session between the remote CPE **102B** and remote GW **106B**. In order to ensure proper operation and data transfer between the respective CPEs **102A, 102B** and GWs **104A, 104B,** these local and remote sessions include various handshaking, negotiation, and training procedures (e.g., V. 34 Phase 2, Phase 3).

In particular, the V.34 protocol provides for the exchange of information sequences between the local CPE **102A** and GW **106A** and the remote CPE **102B** and GW **106B** during start-up, re-training, and re-negotiation sequences. These information sequences reflect the capabilities of, and the modulation parameters (e.g., MP, MP_h sequences) supported by, the local and remote CPEs **102A, 102B** and the local and remote GWs **104A, 104B.** Embedded in the modulation parameter sequences, are the maximum data signaling rate supported by the local and remote CPEs **102A, 102B** and the local and remote GWs **106A, 106B.**

As such, prior to establishing the local and remote sessions, the maximum data signaling rates between the local CPE **102A** and GW **106A** and between the remote CPE **102B** and GW **106B** are exchanged and negotiated in order to determine the most suitable data signaling rates. There exists the possibility, however, that the most suitable data signaling rate between the local CPE **102A** and GW **106A** and the most suitable data signaling rate between the remote CPE **102B** and GW **106B** may be incompatible. At best,

such incompatibility may result in sub-optimal data transmission performance. At worst, such incompatibility may result in the loss of data.

SUMMARY OF INVENTION

Methods and apparatuses consistent with the principles of the present invention, as embodied and broadly described herein, provide for a method of exchanging source-to-sink data rate information across a packet-based network. The method includes receiving, by a first gateway mechanism coupled to said network, data rate information from a first communication device that is configured to operate as a source, sink, or both. The method then determines a first data signaling rate between the first communication device and the first gateway mechanism. Similarly, a second gateway mechanism receives data rate information from a second communication device that is also configured as a source, sink, or both. The method then determines a second data signaling rate between the second communication device and the second gateway mechanism. The first gateway mechanism forwards the data rate information containing the first data signaling rate to the second gateway mechanism and the second gateway mechanism forwards the data rate information containing the second data signaling rate to the first gateway mechanism. The first communication device and the first gateway mechanism determine a maximum compatible source-to-sink data rate based on the first data signaling rate and the second data signaling rate received from the second gateway mechanism. The second communication device and the second gateway mechanism determine a maximum compatible source-to-sink data rate based on the second data signaling rate and the first data signaling rate received from the first gateway mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1A depicts a functional block diagram of a PSTN-based communication system.

FIG. 1B depicts a functional block diagram of a PBN-based communication system.

FIG. 2 depicts a signal flow diagram, constructed and operative in accordance with an embodiment of the present invention.

FIG. 3 depicts a flowchart, illustrating an example operation of an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The following detailed description refers to the accompanying drawings that illustrate embodiments of the present invention. Other embodiments are possible and modifications may be made to the embodiments without departing from the spirit and scope of the invention. Therefore, the following detailed description is not meant to limit the invention. Rather the scope of the invention is defined by the appended claims.

According to an embodiment of the present invention, as indicated in FIG. 2, a first (or local) communication device transmits modulation parameter information containing data signaling rate information to a first (or local) gateway mechanism. Similarly, a second (or remote) communication device transmits modulation parameter information containing data signaling rate information to a second (or remote) gateway mechanism. The data signaling

rate information for both the first and second communication devices represents the source-to-sink data rate. After determining the compatible data rate with the first communication device, the first gateway mechanism accordingly transmits the modulation parameter information to the second gateway mechanism. Similarly, after determining the compatible data rate with the second communication device, the second gateway mechanism commensurately transmits the modulation parameter information to the first gateway mechanism.

Upon receiving the modulation parameter information from the second gateway mechanism, the first gateway mechanism determines the maximum compatible source-to-sink data rate and accordingly sends the modulation parameter information to the first communication device. The sent modulation parameter information will be used to determine a compatible data signaling rate that takes into consideration the capabilities of the first communication device, the first gateway mechanism, the second communication device, and the second gateway mechanism. In like fashion, after receiving the modulation parameter information from the first gateway mechanism, the second gateway mechanism determines the maximum compatible source-to-sink data rate and accordingly sends the modulation parameter information to the second communication device. The sent modulation parameter information will be used to determine a compatible data signaling rate that takes into account the capabilities of the second communication device, the second gateway mechanism, the first communication device, and the first gateway mechanism.

In this manner, the first and second gateway mechanisms are forced to wait until they receive modulation parameter information from each other before settling on a source-to-sink

data rate. By doing so, the present invention ensures that a compatible source-to-sink data rate will be achieved between the first and second communication devices, thereby minimizing the possibility of lost data.

It is to be noted, that the terms “local” and “remote” will be used to simplify the foregoing description of the embodiments of the present invention. It will be appreciated that, because communication devices may transmit data in half- or full-duplex mode, use of the terms “local” and “remote” are not intended to infer half- or full-duplex operations unless expressly indicated otherwise.

FIG. 3 illustrates process **300**, constructed to provide the exchange of data rate information across a packet-based network, in accordance with the present embodiment. As indicated in block **B355**, and in compliance with the V.34 protocol, the data signaling rates are negotiated during the start-up, retrain, and rate re-negotiation sequences. In block **B360A**, the local CPE **102A** receives modulation parameter signals, indicative of the local data signaling rate information, from the local GW **106A**. The local data signaling rate information includes information regarding the rates supported by the local CPE **102A**. As noted in FIG. 2, the data signaling rate information from the local CPE **102A** may be represented by $\mathbf{MP_{AC}}$.

Similarly, in block **B360B**, the remote GW **106B** receives modulation parameter signals, indicative of the remote data signaling rate information, from the remote CPE **102B**. The remote data signaling rate information includes information regarding the rates supported by the remote CPE **102B**. As noted in FIG. 2, the data signaling rate information from the remote CPE **102B** may be represented by $\mathbf{MP_{BC}}$.

In block **B365A**, process **300** determines a local data signaling rate d_A. Local data signaling rate d_A represents the maximum local data signaling rate that may be supported by both the local CPE **102A** and local GW **106A**. Local data signaling rate d_A may be captured and stored in local data signaling rate information $\mathbf{MP_A}$. In like fashion, in block **B365B**, process **300** determines a remote data signaling rate d_B. Remote data signaling rate d_B represents the maximum remote data signaling rate that may be supported by both the remote CPE **102B** and remote GW **106B** and may be captured and stored in remote data signaling rate information $\mathbf{MP_B}$. The determination of data signaling rate d_B may occur after the determination of data signaling rate d_A, although other interactions between the remote CPE **102B** and remote GW **106B** may be concurrent to the interactions between the local CPE **102B** and local GW **106B**

In block **B370A**, process **300** directs the forwarding of $\mathbf{MP_A}$ from the local GW **106A** to the remote GW **106B**. As noted in FIG. 2, $\mathbf{MP_A}$ is forwarded to remote GW **106B**. This ensures that the remote CPE **102B** and GW **106B** possess data signaling rate information about the local CPE **102A** and GW **106A**, prior to establishing a compatible end-to-end data signaling rate. Similarly, in block **B370B**, process **300** directs the forwarding of $\mathbf{MP_B}$ from the remote GW **106B** to the local GW **106A**. This ensures that the local CPE **102A** and GW **106A** possess data signaling rate information about the remote CPE **102B** and GW **106B**, prior to establishing a compatible data signaling rate.

In block **B375A**, process **300** determines whether local GW **106A** has received the remote data signaling rate information $\mathbf{MP_B}$ from remote GW **106B**. If GW **106A** has received $\mathbf{MP_B}$, process **300** advances to block **B385A**. If GW **106A** has not received $\mathbf{MP_B}$, process **300**, in block **B380A**, delays the further processing of GW **106A** until GW **106A** receives $\mathbf{MP_B}$. Such

delay may be achieved by implementing non-functional modulation parameter signals or similar innocuous transactional signals, until the receipt of **MP**$_B$ is confirmed by GW **106A**.

Likewise, in block **B375B**, process **300** determines whether remote GW **106B** has received the local data signaling rate information **MP**$_A$ from local GW **106A**. If GW **106B** has received **MP**$_A$, process **300** advances to block **B385B**. If GW **106B** has not received **MP**$_A$, process **300**, in block **B380B**, delays the further processing of GW **106B** until GW **106B** confirms the receipt of **MP**$_A$.

If local GW **106A** has received **MP**$_B$, process **300**, in block **B385A**, determines a maximum source-to-sink data signaling rate d_{MAX} that is compatible with the remote data signaling rate d_B as well as the received local data signaling rate d_A included in **MP**$_B$. In like fashion, process **300**, in block **B385B**, determines a maximum source-to-sink data signaling rate d_{MAX} that is compatible with the remote data signaling rate d_B as well as the received local data signaling rate d_A included in **MP**$_A$. By doing so, process **300** ensures that the determined maximum source-to-sink data signaling rate d_{MAX} is compatible at both ends of the packet-based network **110**, thereby minimizing the possibility of lost data.

In block **B390A**, process **300** directs the local GW **106A** to send modulation parameter information to the local CPE **102A**. The modulation parameter information conveyed to the local CPE **102A** includes d_{MAX} as well as other information regarding the capabilities of local GW **106A** (indicated by **MP**$_{AG}$ in FIG. 2) and remote CPE **102B** (i.e., **MP**$_B$). Similarly, process **300**, in block **B390B**, directs the remote GW **106B** to send modulation parameter information to the remote CPE **102B**, which includes d_{MAX} as well as local GW **106A** (indicated by **MP**$_{BG}$ in FIG. 2) and remote CPE **102B** (i.e., **MP**$_B$) capabilities.

Finally, in block **B395**, process **300** allows for data transfers to occur between the local CPE **102A** and remote CPE **102B** at the maximum compatible source-to-sink data signaling rate $\boldsymbol{d}_{MAX}$.

It will be appreciated that for half-duplex transmissions, such as in the case of CPEs **102A**, **102B** configured as facsimile machines, the maximum compatible source-to-sink data signaling rate $\boldsymbol{d}_{MAX}$ achieved by process **300** may be used by both CPEs **102A**, **102B**. That is, during the time interval when CPE **102A** operates as a source, CPE **102A** transmits to CPE **102B** at $\boldsymbol{d}_{MAX}$ and during the time interval that CPE **102B** operates as a source, CPE **102B** transmits to CPE **102A** at $\boldsymbol{d}_{MAX}$.

It will also be appreciated that for full-duplex transmissions, such as in the case of CPEs **102A**, **102B** configured as modems, process **300** may be used to possibly determine two values for $\boldsymbol{d}_{MAX}$ (i.e., $\boldsymbol{d}_{MAXA}$ and $\boldsymbol{d}_{MAXB}$). Because CPEs **102A**, **102B** both operate as sources and sinks concurrently during full-duplex operations, the maximum compatible source-to-sink data signaling rate $\boldsymbol{d}_{MAX}$ when CPE **102A** transmits to CPE **102B** may be different than the maximum compatible source-to-sink data signaling rate $\boldsymbol{d}_{MAX}$ when CPE **102B** transmits to CPE **102A**. As such, process **300** may be used to determine one value when CPE **102A** transmits to CPE **102B** (i.e., $\boldsymbol{d}_{MAXA}$) and process **300** may be used to determine another value when CPE **102B** transmits to CPE **102A** (i.e., $\boldsymbol{d}_{MAXB}$).

It will be apparent to one of ordinary skill in the art that the embodiments as described below may be implemented in many different embodiments of software, firmware, and hardware in the entities illustrated in the figures. The actual software code or specialized control hardware used to implement the present invention is not limiting of the present

invention. Thus, the operation and behavior of the embodiments will be described without specific reference to the actual software code or specialized hardware components. The absence of such specific references is feasible because it is clearly understood that artisans of ordinary skill would be able to design software and control hardware to implement the embodiments of the present invention based on the description herein.

Moreover, the processes associated with the presented embodiments may be stored in any storage device, such as, for example, non-volatile memory, an optical disk, magnetic tape, or magnetic disk. Furthermore, the processes may be programmed when the system is manufactured or via a computer-readable medium at a later date. Such a medium may include any of the forms listed above with respect to storage devices and may further include, for example, a carrier wave modulated, or otherwise manipulated, to convey instructions that can be read, demodulated/decoded and executed by the system.

The foregoing description of the preferred embodiments is provided to enable any person skilled in the art to make or use the present invention. Various modifications to these embodiments are possible, and the generic principles presented herein may be applied to other embodiments as well. For example, the invention may be implemented in part or in whole as a hard-wired circuit, as a circuit configuration fabricated into an application-specific integrated circuit, or as a firmware program loaded into non-volatile storage or a software program loaded from or into a data storage medium as machine-readable code, such code being instructions executable by an array of logic elements such as a microprocessor or other digital signal processing unit.

As such, the present invention is not intended to be limited to the embodiments shown above but rather is to be accorded the widest scope consistent with the principles and novel features disclosed in any fashion herein.

WHAT IS CLAIMED

1. A method for exchanging source-to-sink data rate information in a packet-based network, comprising:

receiving, by a first gateway mechanism coupled to said network, data rate information from a first communication device, said first communication device configured to operate as at least one of a source and sink;

determining a first data signaling rate between said first communication device and said first gateway mechanism;

receiving, by a second gateway mechanism coupled to said network, data rate information from a second communication device, said second communication device configured to operate as at least one of a source and sink;

determining a second data signaling rate between said second communication device and said second gateway mechanism;

forwarding data rate information containing said first data signaling rate to said second gateway mechanism; and

forwarding data rate information containing said second data signaling rate to said first gateway mechanism,

wherein said first communication device and said first gateway mechanism determine a first maximum compatible source-to-sink data rate based on said first data signaling rate and said second data signaling rate received from said second gateway mechanism, and

wherein said second communication device and said second gateway mechanism determine a first maximum compatible source-to-sink data rate based on said second data signaling rate and said first data signaling rate received from said first gateway mechanism.

2. The method of Claim 1, wherein said first gateway mechanism implements a delay until it has received said data rate information containing said second data signaling rate from said second gateway mechanism.

3. The method of Claim 2, wherein said second gateway mechanism implements a delay until it has received said data rate information containing said first data signaling rate from said first gateway mechanism.

4. The method of Claim 3, wherein said first communication device and said first gateway mechanism determine said first maximum compatible source-to-sink data rate by selecting the maximum data rate supported by said first communication device, said first gateway mechanism, and said second data signaling rate.

5. The method of Claim 4, wherein said second communication device and said second gateway mechanism determine said first maximum compatible source-to-sink data rate by selecting the maximum data rate supported by said second communication device, said second gateway mechanism, and said first data signaling rate.

6. The method of Claim 5, wherein said data rate information is configured as a modulation parameter sequence in accordance with any of the V series fax/data modem protocols.

7. The method of Claim 6, wherein said first gateway mechanism delay and said second gateway mechanism delay are implemented as a nonfunctional modulation parameter sequence.

8. The method of Claim 7, wherein, for half-duplex transmissions, said first communication device transmits data to said second communication device at said first maximum compatible source-to-sink data rate during a first interval of time when said first communication device operates as said source, and

wherein said second communication device transmits data to said first communication device at said first maximum compatible source-to-sink data rate during a second interval of time when said second communication device operates as said source.

9. The method of Claim 8, wherein said first communication device and said second communication device are configured as facsimile machines operating in half-duplex transmission mode.

10. The method of Claim 7, further including,

determining a second maximum compatible source-to-sink data rate between said first communication device and said first gateway mechanism, based on said first data signaling rate and said second data signaling rate received from said second gateway mechanism, and

determining a second maximum compatible source-to-sink data rate between said second communication device and said second gateway mechanism, based on said second data signaling rate and said first data signaling rate received from said first gateway mechanism.

11. The method of Claim 10, wherein, for full-duplex transmissions, said first communication device transmits data to said second communication device at said first maximum compatible source-to-sink data rate and said second communication device transmits data to said first communication device at said second maximum compatible source-to-sink data rate.

12. The method of Claim 11, wherein said first communication device and said second communication device are configured as modems operating in full-duplex transmission mode.

13. An apparatus for exchanging source-to-sink data rate information in a packet-based network, comprising:

a first communication device configured to communicate data across said network and to operate as at least one of a source and sink of data;

a first gateway mechanism coupled to said network, said first gateway mechanism configured to receive data rate information from said first communication device to determine a first data signaling rate between said first communication device and said first gateway mechanism;

a second communication device configured to communicate data across said network and to operate as at least one of a source and sink of data;

a second gateway mechanism coupled to said network, said second gateway mechanism configured to receive data rate information from said second communication device to determine a second data signaling rate between said second communication device and said second gateway mechanism;

wherein said first gateway forwards data rate information containing said first data signaling rate to said second gateway mechanism and said second gateway mechanism forwards data rate information containing said second data signaling rate to said first gateway mechanism, and

wherein said first communication device and said first gateway mechanism determine a first maximum compatible source-to-sink data rate based on said first data signaling rate and said second data signaling rate received from said second gateway mechanism and said second communication device and said second gateway mechanism determine a first maximum compatible source-to-sink data rate based on said second data signaling rate and said first data signaling rate received from said first gateway mechanism.

14. The apparatus of Claim 13, wherein said first gateway mechanism implements a delay until it has received said data rate information containing said second data signaling rate from said second gateway mechanism.

15. The apparatus of Claim 14, wherein said second gateway mechanism implements a delay until it has received said data rate information containing said first data signaling rate from said first gateway mechanism.

16. The apparatus of Claim 15, wherein said first communication device and said first gateway mechanism determine said first maximum compatible source-to-sink data rate by selecting the maximum data rate supported by said first communication device, said first gateway mechanism, and said second data signaling rate.

17. The apparatus of Claim 16, wherein said second communication device and said second gateway mechanism determine said first maximum compatible source-to-sink data rate by selecting the maximum data rate supported by said second communication device, said second gateway mechanism, and said first data signaling rate.

18. The apparatus of Claim 17, wherein said data rate information is configured as a modulation parameter sequence in accordance with any of the V series fax/data modem protocols.

19. The apparatus of Claim 18, wherein said first gateway mechanism delay and said second gateway mechanism delay is implemented as a nonfunctional modulation parameter sequence.

20. The apparatus of Claim 19, wherein, for half-duplex transmissions, said first communication device transmits data to said second communication device at said first

maximum compatible source-to-sink data rate during a first interval of time when said first communication device operates as said source, and

wherein said second communication device transmits data to said first communication device at said first maximum compatible source-to-sink data rate during a second interval of time when said second communication device operates as said source.

21. The apparatus of Claim 20, wherein said first communication device and said second communication device are configured as facsimile machines operating in half-duplex transmission mode.

22. The apparatus of Claim 19, wherein said first communication device and said first gateway mechanism determine a second maximum compatible source-to-sink data rate, based on said first data signaling rate and said second data signaling rate received from said second gateway mechanism, and

wherein said second communication device and said second gateway mechanism determine a second maximum compatible source-to-sink data rate, based on said second data signaling rate and said first data signaling rate received from said first gateway mechanism.

23. The apparatus of Claim 22, wherein, for full-duplex transmissions, said first communication device transmits data to said second communication device at said first maximum compatible source-to-sink data rate and said second communication device transmits data to said first communication device at said second maximum compatible source-to-sink data rate.

24. A machine-readable medium encoded with a plurality of processor-executable instruction sequences for exchanging data rate information in a packet-based network, said instruction sequences comprising:

receiving, by a first gateway mechanism coupled to said network, data rate information from a first communication device, said first communication device configured to operate as at least one of a source and sink;

determining a first data signaling rate between said first communication device and said first gateway mechanism;

receiving, by a second gateway mechanism coupled to said network, data rate information from a second communication device, said second communication device configured to operate as at least one of a source and sink;

determining a second data signaling rate between said second communication device and said second gateway mechanism;

forwarding data rate information containing said first data signaling rate to said second gateway mechanism; and

forwarding data rate information containing said second data signaling rate to said first gateway mechanism,

wherein said first communication device and said first gateway mechanism determine a first maximum compatible source-to-sink data rate based on said first data signaling rate and said second data signaling rate received from said second gateway mechanism, and

wherein said second communication device and said second gateway mechanism determine a first maximum compatible source-to-sink data rate based on said second data signaling rate and said first data signaling rate received from said first gateway mechanism.

25. The machine-readable medium of Claim 24, wherein said first gateway mechanism implements a delay until it has received said data rate information containing said second data signaling rate from said second gateway mechanism.

26. The machine-readable medium of Claim 25, wherein said second gateway mechanism implements a delay until it has received said data rate information containing said first data signaling rate from said first gateway mechanism.

27. The machine-readable medium of Claim 26, wherein said first communication device and said first gateway mechanism determine said first maximum compatible source-to-sink data rate by selecting the maximum data rate supported by said first communication device, said first gateway mechanism, and said second data signaling rate.

28. The machine-readable medium of Claim 27, wherein said second communication device and said second gateway mechanism determine said first maximum compatible source-to-sink data rate by selecting the maximum data rate supported by said second communication device, said second gateway mechanism, and said first data signaling rate.

29. The machine-readable medium of Claim 28, wherein said data rate information is configured as a modulation parameter sequence in accordance with any of the V series fax/data modem protocols.

30. The machine-readable medium of Claim 29, wherein said first gateway mechanism delay and said second gateway mechanism delay are implemented as a nonfunctional modulation parameter sequence.

31. The machine-readable medium of Claim 30, wherein, for half-duplex transmissions, said first communication device transmits data to said second communication device at said first maximum compatible source-to-sink data rate during a first interval of time when said first communication device operates as said source, and

wherein said second communication device transmits data to said first communication device at said first maximum compatible source-to-sink data rate during a second interval of time when said second communication device operates as said source.

32. The machine-readable medium of Claim 31, wherein said first communication device and said second communication device are configured as facsimile machines operating in half-duplex transmission mode.

33. The machine-readable medium of Claim 30, further including,

determining a second maximum compatible source-to-sink data rate between said first communication device and said first gateway mechanism, based on said first data signaling rate and said second data signaling rate received from said second gateway mechanism, and

determining a second maximum compatible source-to-sink data rate between said second communication device and said second gateway mechanism, based on said

second data signaling rate and said first data signaling rate received from said first gateway mechanism.

34. The method of Claim 33, wherein, for full-duplex transmissions, said first communication device transmits data to said second communication device at said first maximum compatible source-to-sink data rate and said second communication device transmits data to said first communication device at said second maximum compatible source-to-sink data rate.

35. The machine-readable medium of Claim 34, wherein said first communication device and said second communication device are configured as modems operating in full-duplex transmission mode.

METHOD OF DATA RATE EXCHANGE FOR TRANSMISSIONS ACROSS A PACKET-BASED NETWORK

ABSTRACT OF THE DISCLOSURE

A method and apparatus for exchanging data rate information across a packet-based network, is presented herein. In accordance with an embodiment of the invention, a first and second communication device, configured to operate as data sources, sinks, or both, communicate with a first and second gateway mechanism, respectively. The first gateway mechanism receives data rate information from the first communication device to determine a first data signaling rate between the first communication device and the first gateway mechanism. Similarly, the second gateway mechanism receives data rate information from the second communication device to determine a second data signaling rate between the second communication device and the second gateway mechanism. The first gateway forwards data rate information containing the first data signaling rate to the second gateway mechanism and the second gateway mechanism forwards data rate information containing the second data signaling rate to the first gateway mechanism. The first communication device and the first gateway mechanism determine a maximum compatible source-to-sink data rate based on the first data signaling rate and the second data signaling rate received from the second gateway mechanism and the second communication device and the second gateway mechanism determine a maximum compatible source-to-sink data rate based on the second data signaling rate and the first data signaling rate received from the first gateway mechanism.

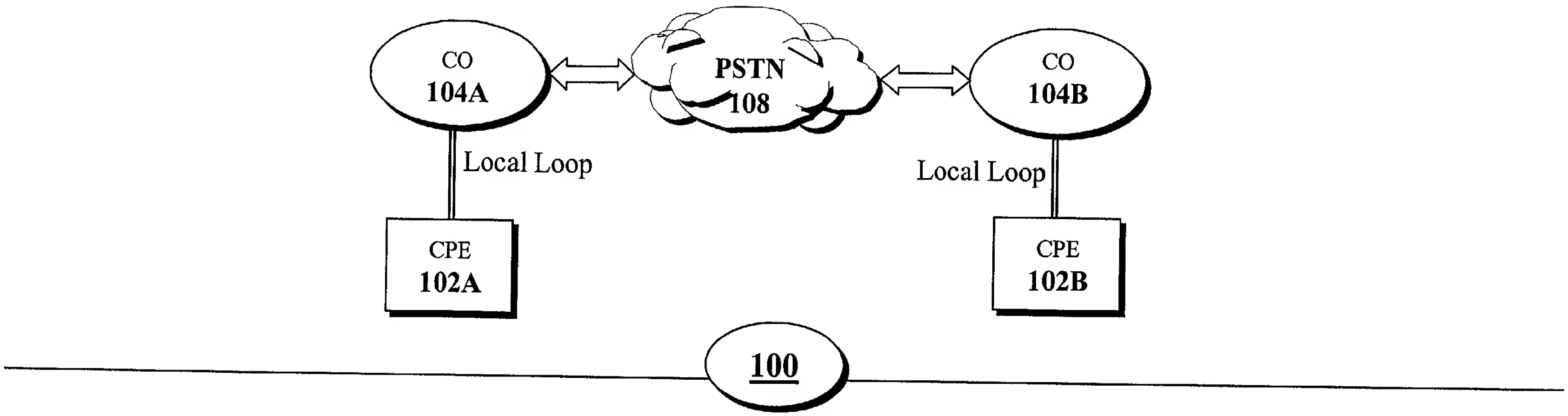

CO
104A
PSTN
108
CO
104B
Local Loop
Local Loop
CPE
102A
CPE
102B
100

FIG. 1A

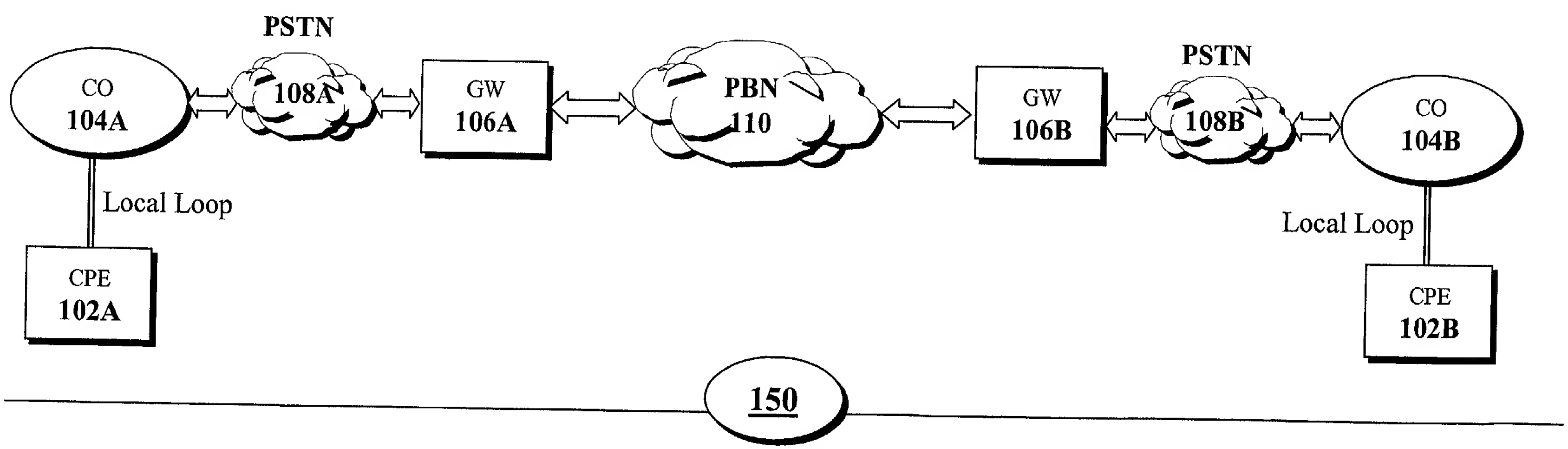
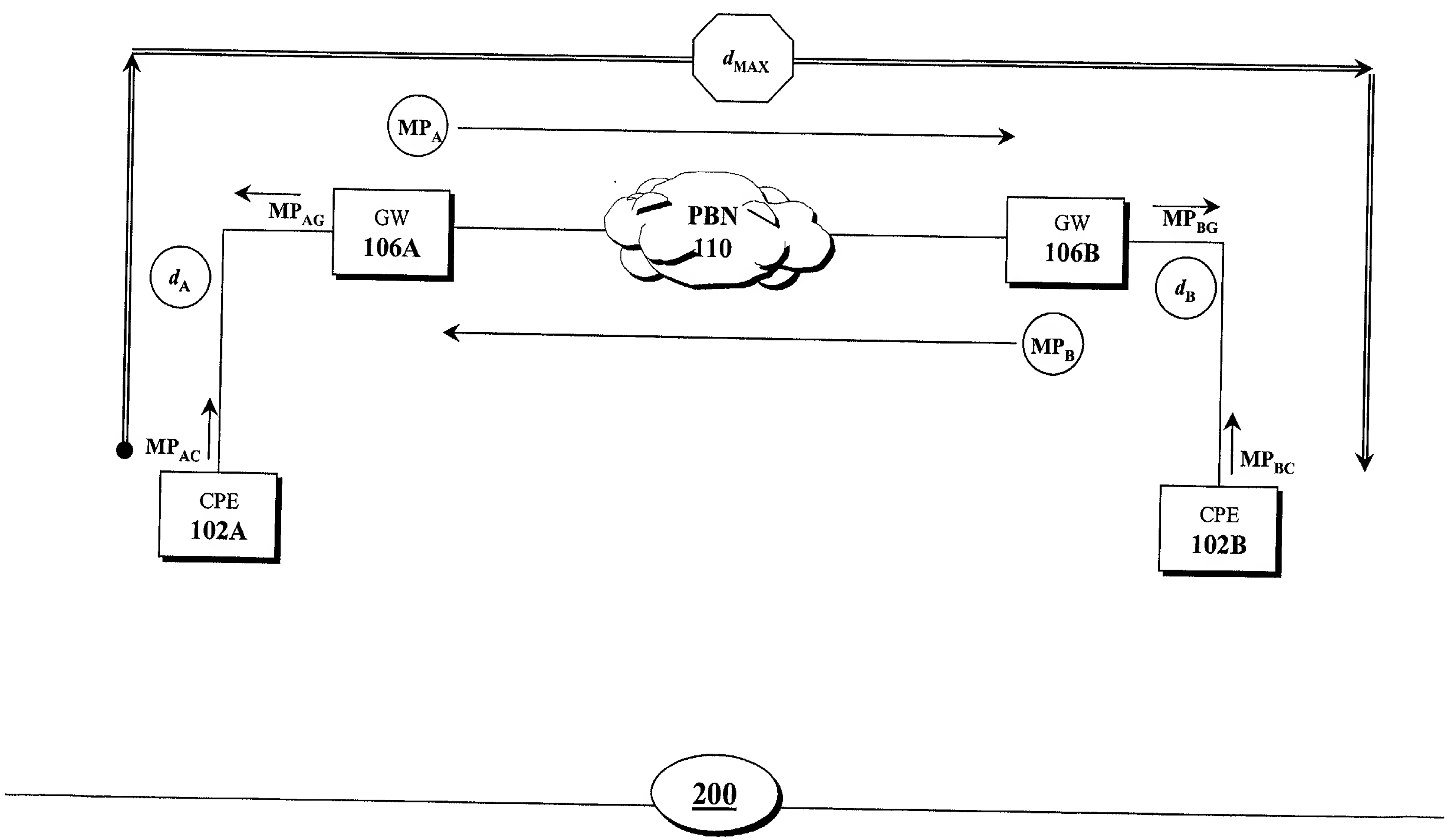

PSTN
CO
104A
108A
GW
106A
PBN
110
GW
106B
PSTN
108B
CO
104B
Local Loop
Local Loop
CPE
102A
CPE
102B
150

FIG. 1B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MPA
MPAG
GW
106A
PBN
110
GW
106B
MPBG
dA
dB
MPB
MPAC
MPBC
CPE
102A
CPE
102B
200

FIG. 2

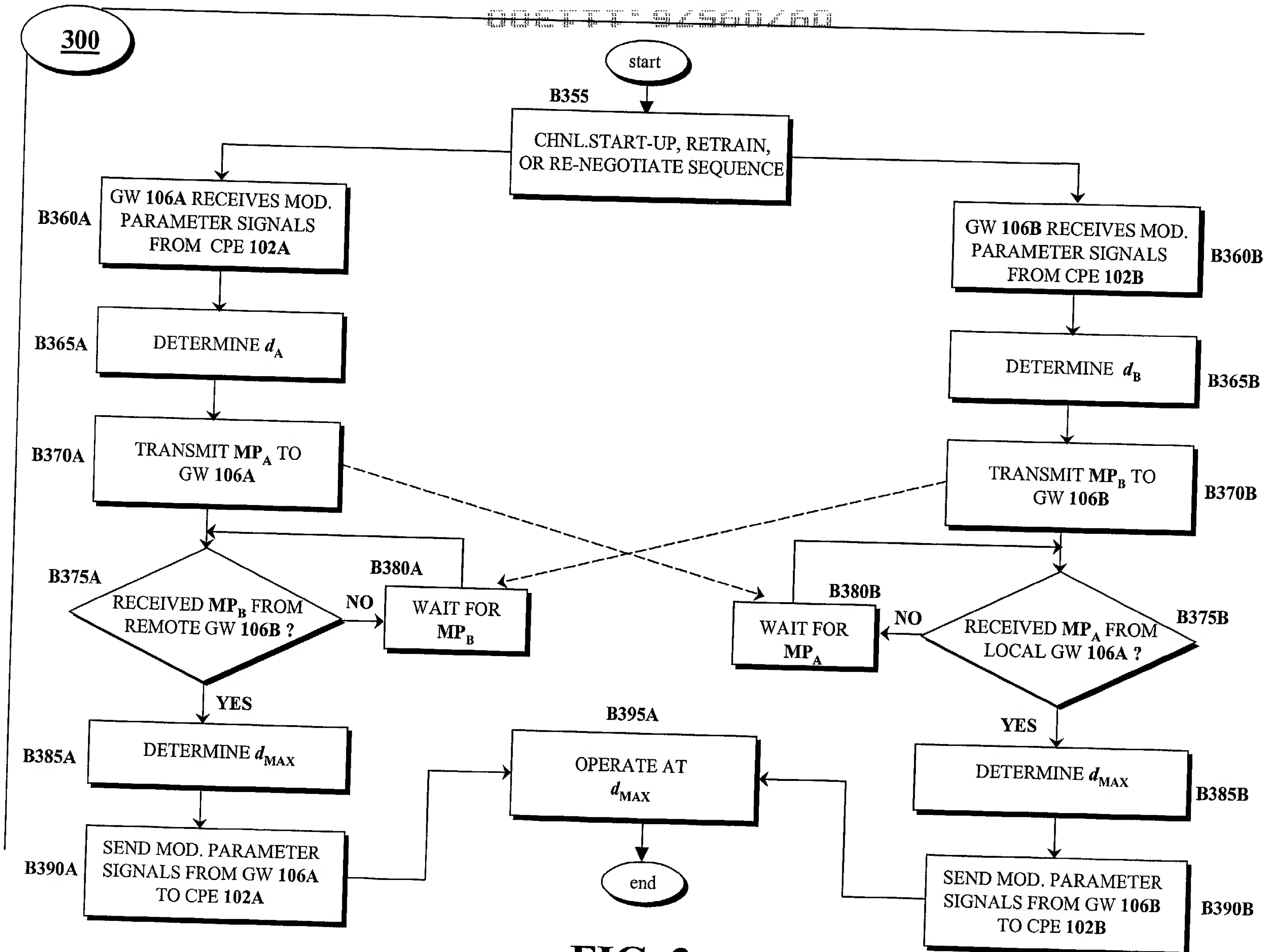
300
start
B355
CHNL.START-UP, RETRAIN, OR RE-NEGOTIATE SEQUENCE
B360A
GW 106A RECEIVES MOD. PARAMETER SIGNALS FROM CPE 102A
B365A
DETERMINE d_A
B370A
TRANSMIT MP_A TO GW 106A
B375A
RECEIVED MP_B FROM REMOTE GW 106B ?
NO
B380A
WAIT FOR MP_B
YES
B385A
DETERMINE d_{MAX}
B390A
SEND MOD. PARAMETER SIGNALS FROM GW 106A TO CPE 102A
B360B
GW 106B RECEIVES MOD. PARAMETER SIGNALS FROM CPE 102B
B365B
DETERMINE d_B
B370B
TRANSMIT MP_B TO GW 106B
B375B
RECEIVED MP_A FROM LOCAL GW 106A ?
NO
B380B
WAIT FOR MP_A
YES
B385B
DETERMINE d_{MAX}
B390B
SEND MOD. PARAMETER SIGNALS FROM GW 106B TO CPE 102B
B395A
OPERATE AT d_{MAX}
end

FIG. 3

FOR UTILITY/DESIGN
CIP/PCT NATIONAL/PLANT
ORIGINAL/SUBSTITUTE/SUPPLEMENTAL
DECLARATIONS

RULE 63 (37 C.F.R. 1.63)
DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PM & S FORM

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name, and I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the INVENTION ENTITLED METHOD OF DATA RATE EXCHANGE FOR TRANSMISSIONS ACROSS A PACKET-BASED NETWORK

the specification of which (CHECK applicable BOX(ES))

X BOX(ES) → A. ☒ is attached hereto.
→ B. ☐ was filed on ________ as U.S. Application No. ____/____
→ C. ☐ was filed as PCT International Application No. PCT/ ____/____ on ________

and (if applicable to U.S. or PCT application) was amended on ________

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose all information known to me to be material to patentability as defined in 37 C.F.R. 1.56. Except as noted below, I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT International Application which designated at least one other country than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate, or PCT International Application, filed by me or my assignee disclosing the subject matter claimed in this application and having a filing date (1) before that of the application on which priority is claimed, or (2) if no priority claimed, before the filing date of this application:

PRIOR FOREIGN APPLICATION(S)

Number	Country	Day/MONTH/Year Filed	Date first Laid-open or Published	Date Patented or Granted	Priority NOT Claimed

If more prior foreign applications, X box *at bottom* and continue on attached page.

Except as noted below, I hereby claim domestic priority benefit under 35 U.S.C. 119(e) or 120 and/or 365(c) of the indicated United States applications listed below and PCT international applications listed above or below and, if this is a continuation-in-part (CIP) application, insofar as the subject matter disclosed and claimed in this application is in addition to that disclosed in such prior applications, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in 37 C.F.R. 1.56 which became available between the filing date of each such prior application and the national or PCT international filing date of this application:

PRIOR U.S. PROVISIONAL, NONPROVISIONAL AND/OR PCT APPLICATION(S)

Application No. (series code/serial no.)	Day/MONTH/Year Filed	Status pending, abandoned, patented	Priority NOT Claimed
60/211,821	15 June 2000	Pending	

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

And I hereby appoint Pillsbury Madison & Sutro LLP, Intellectual Property Group, 1100 New York Avenue, N.W., Ninth Floor, East Tower, Washington, D.C. 20005-3918, telephone number (202) 861-3000 (to whom all communications are to be directed), and the below-named persons (of the same address) individually and collectively my attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith and with the resulting patent, and I hereby authorize them to delete names/numbers below of persons no longer with their firm and to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/ organization who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct the above Firm and/or a below attorney in writing to the contrary.

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Kevin E. Joyce	20508	G. Paul Edgell	24238	Roger R. Wise	31204		
George M. Sirilla	18221	Lynn E. Eccleston	35861	Jay M. Finkelstein	21082		
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FOR ADDITIONAL INVENTORS, "X" box ☒ and proceed on the attached page to list each additional inventor.
☐ See additional foreign priorities on attached page (incorporated herein by reference).

Atty. Dkt. No. PM270173
(M#)

DECLARATION AND POWER OF ATTORNEY
(continued)
ADDITIONAL INVENTORS:

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Residence			
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(include Zip Code)			

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Residence			
	City	State/Foreign Country	Country of Citizenship
Post Office Address			
(include Zip Code)			

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	City	State/Foreign Country	Country of Citizenship
Post Office Address			
(include Zip Code)			

(7) **INVENTOR'S SIGNATURE:** **Date:**

	First	Middle Initial	Family Name
Residence			
	City	State/Foreign Country	Country of Citizenship
Post Office Address			
(include Zip Code)			

(8) **INVENTOR'S SIGNATURE:** **Date:**

	First	Middle Initial	Family Name
Residence			
	City	State/Foreign Country	Country of Citizenship
Post Office Address			
(include Zip Code)			

(9) **INVENTOR'S SIGNATURE:** **Date:**

	First	Middle Initial	Family Name
Residence			
	City	State/Foreign Country	Country of Citizenship
Post Office Address			
(include Zip Code)			

I Suzanne Jones, Notary Public in and for the State of Maryland, hereby swear that on this 9th day of November 2000, did appear before me Zongyao Zhou, Mehul Mehta, and Slobodan Jovanovic.

Suzanne Jones, Notary Public
Expiration: 01-01-02